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THE PHRUDINAE OF TAIWAN (HYMENOPTERA: ICHNEUMONIDAE)[1]

by

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Abstract: The subfamily Phrudinae of Ichneumonidae has not been recorded from Taiwan. This paper presents 5 genera and 11 species from this island. Two known species, *Phrudus monilicornis* Bridgman and *Earobia paradoxus* Perkins are new to Taiwan, and 9 species namely *Brachyscleroma townesi* Chiu, *B. umbilici* Chiu, *Lygurus marjoriae* Chiu, *Phrudus longius* Chiu, *P. montanus* Chiu, *P. angustus* Chiu, *P. linorum* Chiu, *Astrenis granum* Chiu, and *A. densa* Chiu are new to science.

INTRODUCTION

The Phrudinae is one of the small subfamilies of Ichneumonidae (Hymenoptera). It is widely scattered in the Palearctic, Nearctic, Ethiopian and Oriental Regions. Ten genera are known in the world and 5 genera are present in Taiwan. As far as known, the species are internal parasitoids of beetle larvae e.g. *Apoderus* and *Laricobius*. Specimens are usually collected by sweeping in forests.

This paper presents 5 genera and 11 species of the Taiwanese Phrudinae. They are all new records in Taiwan. Among which, 9 species are new to science. All specimens including the types of new species treated in this paper are deposited in the collection of the Taiwan Agricultural Research Institute except for the specimens of *Lygurus marjoriae* Chiu and *Earobia paradoxus* Perkins are borrowed from the American Entomological Institute.

Subfamily **PHRUDINAE**

Fore wing 1.3–4.9 mm. long (Taiwanese species). Body small, slender to stout. Head transverse or erect-rectangular. Clypeus large to rather large, usually weakly convex, its apical margin thick, subtruncate or slightly arched, usually with an apical fringe of parallel hairs, the clypeus separated from face by a groove. Labrum concealed. Mandible with 2 teeth. Malar space with or without a vertical groove between eye and mandible. Antenna with pedicel rather large. Flagellum 12 to 29-segmented. Flagellar segment moniliform or cylindrical, without tyloids. Epomia usually present. Notaulus short or absent. Sternaulus shallow or absent. Propodeum areolated. Areolet present or absent, when present, triangular or subquadrate in shape, second recurrent vein with one bulla, nervulus nearly opposite or distad to basal vein, nervellus not broken or broken below middle. Apex of front tibia without a tooth on outer side. Hind tarsal claws simple or pectinate, at least at base. Tergite 1 slender, with spiracle at, before or behind the middle, glymma usually present. Epi-

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pleura wide and haired. Ovipositor short to long, its tip without a subapical dorsal notch, the tip of lower valve with or without teeth.

Key to the genera of Taiwanese Phrudinae

1. Second discoidal cell broad and short, basal abscissa of subdiscoideus less than 2.0x as long as second recurrent vein. Ovipositor sheath 2.1x to 4.2x as long as the depth of abdomen. 2
   Second discoidal cell narrow and long, basal abscissa of subdiscoideus more than 2.5x as long as second recurrent vein. Ovipositor sheath in length subequal to or less than the depth of abdomen. 3
2. Malar space with a distinct vertical groove between eye and mandible. Clypeus without a distinct transverse groove on midheight, its apex a little prolonged, somewhat pointed. Areolet stalked above. . . . . 1. ***Brachyscleroma***
   Malar space without a vertical groove between eye and mandible. Clypeus with a distinct transverse groove on midheight, its apex slightly roundly curved, somewhat transverse. Areolet lacking. . . . . 2. ***Lygurus***
3. Head and mesoscutum distinctly mat. Tergite 1 comparatively broad about 1.5x as long as apical width. Costula absent. . . . . 3. ***Earobia***
   Head and mesoscutum punctate or partly striate, never mat. Tergite 1 long and slender, 2.0–4.0x as long as apical width. Costula present or absent. 4
4. Areolet present. Hind coxa punctate never granulate. Tergite 1 more or less paralleled on both sides except apical part usually expanded, spiracular area somewhat broader, with or without very few indistinct longitudinal striae. . . . . 4. ***Phrudus***
   Areolet absent. Hind coxa with granulate surface. Tergite 1 broader at or near middle, usually with numerous distinct longitudinal striae. . . . . 5. ***Astrenis***

Genus **BRACHYSCLEROMA** Cushman

Brachyscleroma Cushman, 1940. Proc. U. S. Nat. Mus. 88:369.

Type species: *Brachyscleroma apoderi* Cushman. Original designation.

Fore wing 2.6–4.9 mm. long. Head in frontal view wider than long. Clypeus convexed with apical margin prolonged and somewhat pointed at middle. Malar space with a distinct vertical groove between eye and mandible. Face with coarse, dense and umbilicate punctures, or with moderate-sized and variously distributed punctures. Frons with sparse to moderately dense punctures. Temple sharply slopping backward to occipital carina, with sparse punctures. Flagellum 27 to 29-segmented, the segments cylindrical. Epomia strong on upper part. Mesoscutum densely, coarsely punctate, its margin reflexed and crenulated, notaulus present. Mesopleurum polished with very fine, sparse punctures and impression, sternaulus deep. Areolet stalked above. Second discoidal cell broad, discocubitus strongly arched before its middle, second recurrent vein and basal abscissa of subdiscoideus forming an obtuse angle, the latter about 1.0–1.2x as long as the former. Propodeum well-areolated. Basal half of hind coxa punctate, not mat. Abdominal segments beyond tergite 1 sparsely finely punctate, their terga as well as epipleura with dense hairs. Tergite 1 slender, gradually widened at apical 0.6 part, glymma deep, spiracle behind the middle. Epipleurum of tergite 2 separated from the tergite by a crease. Ovipositor sheath much longer than the depth of abdomen.

Key to the Taiwanese species of *Brachyscleroma*

Face normally punctate. Malar space about 1.8x as long as basal width of mandible. Ovipositor sheath about 2.1x longer than the abdominal depth. . . . . ***townesi*** Chiu, sp. nov.

Face distinctly coarsely densely and umbilicately punctate. Malar space about 1.0x as long as basal width of mandible. Ovipositor sheath about 4.2x longer than the abdominal depth. . . . . ***umbilici*** Chiu, sp. nov.

Brachyscleroma townesi Chiu, sp. nov.

♀: Fore wing (fig. 1a) 3.2–3.8 mm. long. Head (fig. 2a) in frontal view about 0.4x as long as wide. Clypeus with fine and sparse punctures. Malar space about 1.8x as long as basal width of mandible. Face with sparse and variously distributed punctures. Frons moderately densely punctate. Temple finely, sparsely punctate. Flagellum 28-segmented. Notaulus deep. Mesopleurum with a transversely diverging impression, one branch across at its mid-height and another one oblique on it lower posteriorly, somewhat parallel with the sternaulus which is about 0.5x the width of mesopleurum. Propodeum (fig. 3a) sparsely, weakly punctate, petiolar area polished, medially not concaved. Tergite 1 (fig. 4a) 2.4–2.9x as long as apical width (the holotype about 2.8x in ratio), with distinct, numerous, longitudinal striae except basal 0.4 and apex smooth, tergite 2 and its following tergites very finely and sparsely punctate. Ovipositor sheath about 2.1x as long as the abdominal depth.

Black. Mouthparts (except mandibular teeth brown), clypeus (except basal 0.3), scape, pedicel, tegula, front and middle legs and tarsal claws, fulvous. Flagellum with basal 4 to 6 segments fulvous, gradually become darker toward its apex. Epipleura 3 (basal 0.5) and hind leg, light brown. Wings hyaline, pterostigma and venation fuscous.

♂: Very similar to female in structure and color pattern, but differs in fore wing 2.6–3.2 mm. long. Tergite 1 1.7–3.3x as long as apical width.

Holotype ♀. Tayuling (Hualien), 2,560 m, 9–16. VI. 1980, K. S. Lin & B. H. Chen.

Paratypes 21♀, 7♂. Anmashan (Taichung): 2,275 m, 1♀, 6–9. VII. 1979, L. Y. Chou. Meifeng (Nantou): 2,130 m, 1♀, 15–22. V. 1979, Malaise trap; 1♀, 8. VI. 1980, K. S. Lin & B. H. Chen; 2,150 m, 1♂, 26. VIII. 1980, K. S. Lin & C. H. Wang; 2♂, 5–9. X. 1980, C. C. Chen & C. C. Chien; 5♀, 24–26. VI. 1981, K. S. Lin & W. S. Tang; 1♀, 28–29. VIII. 1981, L. Y. Chou & S. C. Lin; 1♀, 15. VII. 1982, S. C. Lin & C. N. Lin. Tayuling (Hualien): 2,560 m, 2♀, 9–16. VI. 1980, K. S. Lin & B. H. Chen; 1♀, 12–15. IX. 1980, K. S. Lin & C. H. Wang. Tsuifeng(Nantou): 2,300 m, 1♀, 16. VII. 1982, S. C. Lin & C. N. Lin. Tungpu (Nantou): 1,200 m, 1♀, 25–29. IX. 1980, L. Y. Chou & T. Lin; 1♀, 28. IV-2. V. 1981, T. Lin & C. J. Lee; 1♀, 18–23. XI. 1981, T. Lin & W. S. Tang; 1♀, 19–23. VII. 1982, L. Y. Chou & T. Lin; 1♀, 18–21. X. 1982, K. C. Chou & S. C. Lin; 1♀, 10–14. I. 1983, K. C. Chou & S. P. Huang. Wuling (Taichung): 1,900 m, 1♀, 27–29. VI. 1979, K. S. Lin & L. Y. Chou. Wushe (Nantou): 1,150 m, 1♂, 26–28. VIII. 1981, L. Y. Chou & S. C. Lin; 1♂, 30. VII-2. IX. 1982, L. Y. Chou & K. C. Chou; 1♂, 7–8. X. 1982, K. C. Chou. Yushih (Nantou): 1,750 m, 1♂, 4. VIII. 1981, T. Lin & W. S. Tang.

The name "*townesi*" is in honor of Dr. Henry K. Townes.

This species has the tergite 1 entirely black. Face with fine sparse punctures. Malar space about 1.8x as long as basal width of mandible. Ovipositor sheath about twice as long as abdominal depth.

Brachyscleroma umbilici Chiu, sp. nov.

♀: Fore wing (fig. 1b) 4.1–4.9 mm. long. Head (fig. 2b) in frontal view about 0.5x as long as wide. Clypeus partly with coarse and dense punctures. Malar space in length subequal to basal width

of mandible. Face with dense, coarse, umbilicate punctures. Frons coarsely densely punctate. Temple finely, sparsely punctate. Flagellum 28-segmented. Notaulus distinct, somewhat shallow. Mesopleurum with a transversely diverging impression, its upper branch crenulate, across about at midheight of the mesopleurum, and another branch smooth, more or less parallel to sternaulus which is about 0.5x the width of mesopleurum. Propodeum (fig. 3b) finely punctate, petiolar area medially somewhat concaved. Tergite 1 (fig. 4b) 2.8–3.2x as long as apical width (the holotype about 2.8x in ratio), with numerous longitudinal striae except basal 0.5 and the apex smooth. Tergite 2 and its following tergites with very fine and weak punctures. Ovipositor sheath about 4.2x as long as the abdominal depth.

Black. Mouthparts (except mandibular teeth brown), clypeus, face, frontal orbit (sometimes), scape, pedicel, mesoscutum (sometimes partly), scutellum (or apex only) and troughs of mesonotum and metanotum, postscutellum, propodeum (sometimes with basal 0.2–0.4 and apical margin black, tergite 1 (apical 0.5 black), tergite 4 (apically) and following tergites, or tergite 2 and its following tergites and epipleura of tergites 2, yellow to yellowish brown. Flagellum with basal 4 segments fulvous and gradually become darker toward its apex. Legs fulvous, hind coxa (except dorsally black), hind femur and hind tibia, light brown. Wings hyaline, pterostigma and venation fuscous.

♂: Very similar to female, but differs in having fore wing 3.6–4.2 mm. long. Tergite 1 3.1–3.4x as long as apical width, medially of petiolar area slightly concaved. Head entirely black. Hind coxa (ventrad lighter) black. Body more black colored.

Holotype ♀. Kenting (Pingtung), 18–23. III. 1981, K. S. Lin & T. Lin.

Paratypes 2♀, 6♂. Chiapaotai (Taichung): 750 m, 3♂, 14–18. X. 1980, K. S. Lin & C. H. Wang. Lienhuachih (Nantou): 650 m, 1♂, VII. 1984, Malaise trap. Meifeng (Nantou): 2,150 m, 1♀, 24–26. VI. 1981, K. S. Lin & W. S. Tang. Nantuan = Nansyo (Miaoli): 1♀, 16. V. 1937, J. Sonan. Taipinshan (Ilan) = Sankan, Taiheizan: 1♂, 16–18. VII. 1938, J. Sonan. Tungpu (Nantou): 1,200 m, 1♂, 19–23. VII. 1982, L. Y. Chou & T. Lin.

The name "*umbilici*" means navel, referring to the umbilicate punctures on the face.

This species can be recognized by its face with coarse, dense and umbilicate punctures. Malar space subequal in length of basal width of mandible. Ovipositor sheath rather long, about 4.0x as long as abdominal depth.

Genus **LYGURUS** Kasparyan

Lygurus Kasparyan, 1983. Contrib. Amer. Ent. Inst. 20:116–118.

Type species: *Lygurus townesi* Kasparayan. Original designation.

Fore wing 3.3–4.3 mm. long. Head in frontal view wider than long. Clypeus transverse, with a distinct, transverse groove at midheight, apical margin slightly rounded, not distinctly produced. Lower mandibular tooth slightly shorter than the upper tooth. Malar space without a vertical groove. Face, frons, vertex and temple, sparsely to densely punctate. Occipital carina transverse. Flagellum 20 to 22-segmented, flagellar segments cylindrical. Pronotum punctate, epomia present. Mesoscutum densely punctate, notaulus short or long. Mesopleurum moderately to densely punctate, somewhat mat, sternaulus present (Taiwanese species). Tarsal claw simple. Areolet lacking, second discoidal cell broad, second recurrent vein and basal abscissa of subdiscoideus forming an acute angle. Propodeum finely punctate, well-areolated. Abdominal tergites punctate and sparsely haired. Tergite 1 slender, gradually widened toward apex, glymma deep and large, spiracle behind the middle. Epipleurum of tergite 2 separated from the tergite by a crease. Ovipositor sheath much longer than the depth of abdomen.

Lygurus marjoriae Chiu, sp. nov.

♀: Fore wing (fig. 1c) 4.1 mm. long. Head (fig. 4c) in frontal view about 0.6x as long as wide. Clypeus convex, about 2.9x as wide as long, basal half coarsely punctate, apical half with very few coarse punctures. Malar space moderately densely punctate, about 0.8x as long as basal width of mandible. Face and frons evenly densely punctate. Vertex and temple finely weakly punctate. Occipital carina joining hypostomal carina above mandible by about 0.7x basal width of mandible. Flagellum 22-segmented. Epomia long, distinct but not strong. Pronotum finely weakly sparsely punctate, hind margin with a few short striae. Mesoscutum evenly densely punctate, notaulus long, moderately deep, almost reaching a transverse line between base of tegula. Scutellum evenly densely punctate, lateral carina distinct from base to apex. Mesopleurum weakly mat, finely sparsely punctate except speculum impunctate, the punctures on lower half are coarser and denser, sternaulus short and distinct. Basal abscissa of subdiscoideus about 2.0x as long as the second recurrent vein. Propodeum (fig. 3c) weakly rugose, sparsely punctate, somewhat mat, moderately strongly carinate, spiracle small and circular. Tergite 1 (fig. 4c) slender, with distinct longitudinal striae except basal 0.3 wrinkled, the tergite about 3.4x as long as apical width, median dorsal carina obiterated, dorsolateral carina complete, spiracle slightly behind the middle. Epipleura of tergite 2 (entirely) and tergite 3 (basal 0.3) separated from their tergites by a crease.

Black. Antenna brownish black, mandible (teeth brown), clypeus (basal margin brown), palpi, hind corner of pronotum, tegula, and subtegular ridge, yellow. Face (centrally), facial orbit, frontal orbit and temporal orbit, brownish yellow. Malar space light brown. Legs fulvous to brown, front and middle femora and all tarsi, fuscous. Hind leg with coxa black, first trochanter marked with black, femur fulvous (dorsally dark), tibia (dorsally), and tarsus blackish, base of second to fourth tarsal segments yellow, tarsal claws brown. Tergite 1 black, tergites 2 to 4 dark brown to black, hind margin of tergite 2 and basal margin of tergite 3, brownish yellow. Wing hyaline, pterostigma and venation brownish black. Ovipositor sheath brownish black, ovipositor reddish brown.

Holotype ♀. Meifeng (Nantou), 2,150 m, 3. V. 1983, Henry Townes (American Entomological Institute).

Paratype ♀. Same data as holotype (American Entomological Institute).

This species is characteristic by its clypeus with a distinct transverse groove at midheight, apical margin slightly rounded. Malar space without vertical groove. Areolet lacking. Propodeum well-areolated. Tergite 1 with deep and large glymma, spiracle behind the middle. Hind tarsal claws simple. Ovipositor sheath extraordinary long, about 7.8x longer than its abdominal depth.

This species is named in honor of Mrs. Marjorie Townes.

Genus **EAROBIA** Townes

Earobia Townes, 1951. *In* Townes and Townes, Proc. Ent. Soc. Wash. 53:307.

Type species: *Earobia minor* Townes. Monotypic and original designation.

Echthrolaricobius Perkins, 1958. Entomophaga 3:146.

Type species: *Echtrolaricobius paradoxus* Perkins. Monotypic and original designation.

Fore wing 2.6 mm. long. Head in frontal view wider than long. Clypeus at midheight without a transverse groove. Mandibular teeth subequal in length. Malar space without a vertical groove. Face frons, vertex and temple, mat. Occipital carina rounded medially. Pronotum mat, epomia

present. Mesoscutum mat and punctate, notaulus present, scutellum punctate, sternaulus visible. Areolet sessile, second recurrent vein and basal abscissa of subdiscoideus forming nearly a right angle, pterostigma broad. Propodeum areolate. Hind tarsal claws simple. Tergite 1 short and broad, median dorsal carina present, glymma deep, spiracle before the middle. Epipleurum of tergite 2 separated from the tergite by a crease. Ovipositor sheath in length subequal to the depth of abdomen.

Earobia paradoxus Perkins

Echthrolaricobius paradoxus Perkins, 1958. Entomophaga 3:146. Description. Type ♀, Seegraben near Zurich, Switzerland (BRITISH MUSEUM). Identified from the description.

♀: Fore wing (fig. 1d) 2.6 mm. long. Head (fig. 2d) in frontal view about 0.6x as long as wide. Clypeus mat, coarsely punctate, strongly convex, about 3.7x as wide as long, not separated from face by a groove. Mandible mat and punctate. Malar space mat and punctate, about 1.0x as long as basal width of mandible. Face, frons and vertex mat, without punctures, temple weakly mat, sparsely weakly punctate. Occipital carina roundly arched medially. Flagellum 17-segmented. Pronotum mat, epomia present only its upper part. Mesoscutum mat and punctate, punctures on lateral area more distinct. Scutellum coarsely sparsely punctate, lateral area mat, lateral carina present on basal 0.2. Mesopleurum mat with weak sparse punctures, sternaulus shallow. Second discoidal cell comparatively broad, basal abscissa of subdiscoideus about 1.4x as long as second recurrent vein, nervulus distad to basal vein, nervellus broken below middle. Propodeum (fig. 3d) mat, weakly sparsely punctate, costula absent, basal area and areola fused. Abdominal segments finely sparsely punctate, covered with evenly moderately dense hairs, gradually compressed beyond tergite 3. Tergite 1 (fig. 4d) broad, about 1.5x as long as apical width, weakly mat and sparsely punctate, with numerous longitudinal striae, median dorsal carina distinct. Epipleurum of tergite 2 entirely separated from the tergite by a crease. Ovipositor sheath about 0.9x as long as abdominal depth.

Brownish black to black. Mandible browish yellow except teeth brown. Palpi yellow. Clypeus light brown. Antenna entirely black except scape apically yellow. Legs dark brown to blackish brown with coxae darker. Pterostigma and venation fuscous. Ovipositor fulvous, sheath infuscate.

♂: Unknown.

Specimen examined. 1♀. Meifeng, 2,150 m, 16. IV. 1983, Henry Townes (American Entomological Institute).

This species can be recognized by its body evenly covered with conspicuous pubescence. Head and thorax mat. Pterostigma and second discoidal cell broad. Propodeum without costula, hind tarsal claws simple. Tergite 1 stout, about 1.5x as long as apical width, spiracle before the middle. Ovipositor short.

Genus **PHRUDUS** Foerster

Phrudus Foerster, 1869. Verh. Naturh. Ver. Rheinlande 25:196.

Type species: *Phrudus monilicornis* Bridgman. Included by Dalla Torre, 1901.

Phrudus Bridgman, 1886. Trans. Ent. Soc. London 19:361. Name preoccupied by Foerster, 1869.

Type species: *Phrudus monilicornis* Bridgman. Monobasic.

Ktenostilpnus Strobl, 1901. Mitt. Naturw. Ver. Stiermark 37:256.

Type species: (*Ktenostilpnus aequearticulatus* Strobl) = *monilicornis* Bridgman. Monobasic.

Vendolius Roman, 1914. Arkiv. for Zool. 9(2):35.

Type species: (*Vendolius stilpninus* Roman) = *monilicornis* Bridgman. Monobasic.

Fore wing 1.3–3.6 mm. long. Head in frontal view wider than long, or much longer than wide. Clypeus wide, apical margin somewhat transverse or subtruncate. Malar space without a vertical groove between eye and mandible. Face with sparse to dense punctures. Frons polished with rather sparse punctures. Temple full and wide. Flagellum 12 to 20-segmented, males usually with more segments than females, the segments cylindrical, several segments near apex somewhat moniliform. Mesoscutum with apical and lateral margins upcurved and crenulated, notaulus present or absent. Mesopleurum polished and punctate, partly wrinkled, sternaulus indistinct or absent. Areolet subquadrate, pterostigma broad, second discoidal cell long and narrow, second recurrent vein and basal abscissa of subdiscoideus usually forming a right angle, the latter 2.4–3.0x as long as the former. Propodeum areolated. Hind coxa punctate, hind tarsal claws pectinate with strong pectinae. Tergite 1 usually slender, punctate or with a few longitudinal striae, both sides approximately paralleled each other except apical part, median dorsal carina present, spiracle nearly at middle of the tergite, glymma present. Tergite 2 and its following tergites polished with very few sparse and weak punctures. Epipleurum of tergite 2 separated from the tergite by a crease. Ovipositor sheath in length subequal to the depth of abdomen.

Key to the Taiwanese species of *Phrudus*

1. Head in frontal view 1.0–1.3x as long as wide. Notaulus present. Second pleural area of propodeum with numerous transverse striae. Petiolar area distinctly longer than wide, with extremely narrow base. . . . . ***longius*** Chiu, sp. nov.
   Head in frontal view 0.6–0.8x as long as wide. Notaulus absent or present. Second pleural area of propodeum obscurely punctate, not striate. Petiolar area not as above, mostly subequal in length and width. 2
2. Notaulus absent. Temple moderately densely punctate. Tergite 1 comparatively broad and short, 2.2–2.4x as long as apical width. . . . . ***monilicornis*** Bridgman
   Notaulus present. Temple almost impunctate to finely and sparsely punctate. Tergite 1 narrow and long, 3.0–4.7x as long as apical width. 3
3. Tergite 1 about 3.0x as long as apical width. Median dorsal carinae distinctly closer each other at middle. Flagellum 20-segmented. . . . . ***montanus*** Chiu, sp. nov.
   Tergite 1 about 4.0x or more as long as apical width. Median dorsal carinae not distinctly closer each other at middle. Flagellum 12 to 16-segmented. 4
4. Tergite 2 about 1.4x as long as apical width. Basal transverse carina of propodeum present. . . . . ***angustus*** Chiu, sp. nov.
   Tergite 2 about 0.7x as long as apical width. Basal transverse carina of propodeum absent. . . . . ***linorum*** Chiu, sp. nov.

Phrudus longius Chiu, sp. nov.

♀: Fore wing (fig. 1e) 1.3–1.5 mm. long. Head (fig. 2e) in frontal view erect-rectangular about 1.3x as long as wide. Clypeus weakly convex, about 2.8x as wide as long, separated from face by a distinct groove. Malar space in length subequal to basal width of mandible. Face polished, sparsely punctate. Frons extremely, sparsely, weakly punctate. Temple unusual wide in profile, nearly impunctate, evenly curve backward to occipital carina. Flagellum 12-segmented. Notaulus crenulated. Mesopleurum very finely and sparsely punctate, its lower 0.4 with a few transverse striae, sternaulus absent. Metapleurum punctato-striate. Propodeum (fig. 2e) polished, lateral carina of areola sometimes obscure, petiolar area about 1.8x as long as wide, with coarse surface, second pleural area with

numerous, short, transverse striae. Tergite 1 (fig. 4e) smooth with a few distinct longitudinal striae on apico-laterally, about 3.7–4.5x as long as apical width (the holotype about 4.5x in ratio), median dorsal carina distinct reaching about 0.8x of the tergite. Tergite 2 trapezoid, about 1.6x as long as apical width.

Black. Mouthparts (except mandibular teeth brownish), antenna (except flagellum apically darker), tegula and abdominal tergites beyond tergite 2, light brown. Legs fulvous to light brown. Wings hyaline, pterostigma fuscous, venation fulvous.

♂: Structure and color very similar to female, but differs in frontal view of head about 1.0x as long as wide. Temple roundly curved backward to occipital carina. Flagellum 13-segmented. Tergite 1 3.5–4.3x as long as apical width.

Holotype ♀. Shantimen (Pingtung), 24. III. 1982, K. C. Chou & C. C. Pan.

Paratypes 17♀, 44♂. Chihpen (Taitung): 1♂, 17–18. II. 1982, L. Y. Chou & K. C. Chou. Fuli (Hualien-Tungho, Taitung): 5♀, 7♂, 9–11. XI. 1982, K. C. Chou & S. P. Huang. Kenting (Pingtung): 1♂, 22–26. III. 1982, T. Lin & S. C. Lin; 3♂, 25–28. V. 1982, K. C. Chou & C. C. Pan. Kukuan (Taichung): 730 m, 1♀, 14–17. 1980, K. S. Lin & C. H. Wang. Laii (Pingtung): 1♂, 3. II. 1983, K. C. Chou & S. P. Huang. Maolin (Kaohsiung): 5♂, 26. III. 1982, K. C. Chou & C. C. Pan. Shantimen (Pingtung): 7♀, 15♂, 1–5. III. 1982, K. C. Chou & C. C. Pan; 1♀, 7♂, 31. I-4. II. 1983, K. C. Chou & S. P. Huang; 1♀, 1♂, 16–20. I. 1984, K. C. Chou & C. C. Pan. Tungpu (Nantou): 1,200 m, 1♀, 23–27. VII. 1984, K. C. Chou & C. H. Yang. Wanfeng (Taichung): 1♂, 4–5. IV. 1980, K. S. Lin. Wushe (Nantou): 1,150 m, 1♀, 7–8. X. 1982, K. C. Chou.

The name "*longius*" means longer, referring to its unusual long head.

This species is easily recognized by its body-size smaller, and female head erect-rectangular in frontal view. Temple nearly impunctate. Notaulus present. Tergite 1 slender, about 4.5x as long as apical width, tergite 2 trapezoid, about 1.6x as long as apical width.

Phrudus monilicornis Bridgman

Phrudus monilicornis Bridgman 1886. Trans. Ent. Soc. London 19:361. ♀, ♂ Original description. Types ♀, ♂ Shiere (BRITISH MUSEUM).

♀: Fore wing (fig. 1f) about 3.4 mm. long. Head (fig. 2f) in frontal view transverse-rectangular, about 0.9x as long as wide. Clypeus about 3.0x as wide as long, slightly convex, separated from face by a very shallow groove, with various-sized, sparse to dense punctures. Malar space about 0.8x as long as basal width of mandible. Face rather densely punctate. Frons sparsely punctate, with various-sized punctures. Temple wide and roundly curved backward, with sparse to dense punctures. Falgellum 16 to 17-segmented. Mesoscutum densely punctate, notaulus absent. Mesopleurum moderately to densely punctate except its central part almost impunctate. Scutellum densely punctate. Propodeum (fig. 3f) well-areolate, finely to coarsely punctate, pleural area weakly punctate, without striae, petiolar area nearly quadrate, with moderately dense punctures except those on basal 0.3 are sparser. Tergite 1 (fig. 4f) with very few fine, sparse punctures, the tergite about 2.2x as long as apical width, median dorsal carina lower, broader and shorter than those of *longius*. Tergite 2 transverse, about 0.6x as long as apical width.

Brown to black. Mouthparts (except mandibular teeth brown) and tegula light brown. Abdominal tergite 1 black. Tergite 2 entirely and tergite 3 (except apical 0.3 darker), light brown. The rest tergites light brown to dark brown. Legs light brown. middle and hind coxae or front coxa also dark brown, hind tarsal claws blackish. Wings hyaline, pterostigma fuscous, venation light brown.

♂: Very similar to female, differs in flagellum 19-segmented, tergite 2 about 2.4x as long as apical width, somewhat wrinkled on both sides.

Specimens examined 6♀, 1♂. Meifeng (Nantou): 2,150 m, 1♂, 20–22. VI. 1979, K. S. Lin & B. H. Chen; 1♀, 1♂, 7–9. V. 1981, K. S. Lin & B. H. Chen; 1♀, 19–21. IV. 1983, K. C. Chou & S. P. Huang; 1♀, 8–11. V. 1984, K. C. Chou & C. C. Pan. Tayuling (Hualien): 2,560 m, 3♀, 9–16. VI. 1980, K. S. Lin & B. H. Chen.

This species has its head transverse in frontal view. Temple moderately densely punctate. Notaulus lacking. Tergite 1 comparatively broad, about 2.2x as long as apical width, tergite 2 transverse, about 0.6x as long as apical width.

Phrudus montanus Chiu, sp. nov.

♀: Fore wing (fig. 1g) about 2.6 mm. long. Head (fig. 2g) in frontal view about 0.6x as long as wide. Clypeus about 3.0x as wide as long, with sparse and fine punctures, separated from face by a deep groove. Malar space about 1.0x as long as basal width of mandible. Face moderately densely punctate. Frons as well as temple sparsely to very sparsely finely punctate. Temple wide and roundly curved backward. Flagellum 20-segmented. Notaulus as usual, without carina on the furrow. Mesopleurum evenly convex with fine and sparse punctures except centrally impunctate. Propodeum (fig. 3g) areolated, petiolar area sparsely punctate, nearly as long as wide. Tergite 1 (fig. 4g) about 3.0x as long as apical width, median dorsal carina strong, the carinae distinctly closer to each other at middle. Tergite 2 about 0.6x as long as apical width.

Black. Mouthparts (except mandibular teeth brown) fulvous. Antenna fuscous to blackish. Tegula brownish. Legs light brown, all coxae stained with dark brown. Wings hyaline, pterostigma and venation fulvous.

♂: Unknown.

Holotype ♀. Tayuling (Hualien), 2,560 m, 12–15. IX. 1980, K. S. Lin & C. H. Wang.

The name "*montanus*" means mountain, referring to the collecting locality was in the high mountain.

This species has its head transverse in frontal view. Temple sparsely to very sparsely finely punctate. Notaulus present. Antenna longer, flagellum 20-segmented. Tergite 1 about 3.0x as long as apical width, tergite 2 transverse about 0.6x as long as apical width.

Phrudus angustus Chiu, sp. nov.

♂: Fore wing (fig. 1h) about 2.0 mm. long. Head (fig. 2h) in frontal view nearly as long as wide. Clypeus about 2.6x as wide as long, with sparse and weak punctures, separated from face by a deep groove. Malar space about 1.3x as long as basal width of mandible. Face as well as frons finely sparsely punctate. Temple wide, nearly impunctate, roundly backward to occipital carina. Flagellum 13-segmented. Notaulus with a single carina on the furrow. Mesopleurum finely and sparsely punctate except central part smooth, with a few oblique striae near lower 0.4. Propodeum (fig. 3h) smooth, finely carinated, areola with both the sides open, pleural area without striae, petiolar area strigose, almost as long as wide. Tergite 1 (fig. 4h) polished, impunctate, about 4.7x as long as apical width, median dorsal carina strong except apical 0.25 weaker. Tergite 2 slender, about 1.4x as long as apical width.

Dark brown to black. Mouthparts (except mandibular teeth brown), tegula and legs fulvous. All coxae and hind femur stained with brown. Abdomen black except tergites 1, 2 and basal 0.5 of tergite 3, brown.

♀: Very similar to male in color and structure, but differs in having flagellum 12-segmented, petiolar area longer, about 1.3x as long as wide, abdomen entirely brown, fore wing missing, hind wing broken.

Holotype ♂. Tayuling (Hualien), 2,560 m, 10–15. IX. 1980, Malaise trap.

Paratype ♀. Mucha (Taipei), 8. VIII. 1967, S. H. Lin.

The name "*angustus*" means narrow, referring to the comparatively narrow tergite 2.

This species can be recognized by its propodeum with incomplete areola and strigose petiolar area. Tergite 1 long and narrow, about 4.7x as long as apical width, tergite 2 trapezoid, about 1.4x as long as apical width.

Phrudus linorum Chiu, sp. nov.

♂: Fore wing (fig. 1i) about 2.0 mm. long. Head (fig. 2i) in frontal view about 0.5x as long as wide. Clypeus about 3.3x as wide as long, sparsely coarsely punctate, separated from face by a shallow groove. Malar space about 1.0x as long as basal width of mandible. Face sparsely, weakly punctate. Frons sparsely punctate with various-sized punctures. Temple wide, sparsely punctate. Flagellum 16-segmented. Notaulus with a single carina on the furrow. Mesopleurum sparsely, finely punctate with central part smooth, the punctures on lower 0.5 sparser. Propodeum (fig. 3i) sparsely punctate, basal transverse carina absent, pleural area without striae, petiolar area sparsely punctate about 1.4x as long as wide. Tergite 1 (fig. 4i) about 4.0x as long as apical width, median dorsal carina nearly reaching apex, the carinae paralleled each other. Tergite 2 transverse about 0.7x as long as apical width.

Dark brown to black. Mouthparts (except mandibular teeth brown), antenna and tegula, fuscous. Abdomen black except tergite 1 and basal 0.5 of tergite 2, dark brown. Legs fulvous, with all coxae and hind femur, brownish. Wings hyaline, pterostigma and venation fuscous.

♀: Unknown.

Holotype ♂. Meifeng (Nantou), 2,150 m, 7–9. V. 1981, K. S. Lin & S. C. Lin.

The name "*linorum*" is derived from the last name of the specimen collectors, Messrs. K. S. Lin and S. C. Lin.

This species is characterized by its propodeum lacking basal transverse carina. Tergite 1 about 4.0x as long as apical wide, tergite 2 transverse, about 0.7x as long as apical width.

Genus **ASTRENIS** Foerster

Astrenis Foerster, 1868. Verh. Naturh. Ver. Rheinlande 25:148.

Type species: *Hambergiella sinuata* Roman. Designated by Perkins, 1962.

Orona Cameron, 1905. Invertebrata Pacifica 1:131. Name preoccupied by Haeckel, 1887.

Type species: *Orona petiolaris* Cameron. Monobasic.

Mengersenia Schmiedeknecht, 1907. Die Hymenopteren Mitteleuropas, p. 606.

Type species: *Mengersenia paradoxa* Schmiedeknecht. Monobasic.

Hambergiella Roman, 1909. *In* Hamberg: Naturwissenschaftliche Untersuchungen des Sarekgebirges in Schwedisch-Lappland 4:359.

Type species: *Hambergiella sinuata* Roman. Monobasic.

Fore wing 2.1–2.8 mm. long. Head in frontal view wider than long. Clypeus wide and convex, separated from face by a groove, apical margin somewhat transverse. Malar space without a vertical groove between eye and mandible. Face strongly convexed centrally, usually finely punctate as well

as frons. Temple wide, not swollen, with extremely fine punctures and sparse or dense hairs. Flagellum 15–20 segmented, males usually with more segments than the females, the segment cylindrical, several segments near apex somewhat moniliform. Epomia long, usually almost reaching the front edge of mesoscutum. Notaulus deep. Mesoscutum with anterior and lateral margins reflexed and crenulated. Mesopleurum usually polished and nearly impunctate except upper part evenly moderately densely punctate, with a transverse depression at its midheight, lower 0.2 area usually with a few distinct striae, sternaulus absent. Metapleurum mat. Propodeum areolated, with strong carina and sparse, weak punctures. Areolet lacking, second discoidal cell long and narrow, pterostigma narrow, nervulus nearly opposite, or slightly distad to basal vein, second recurrent vein and basal abscissa of subdiscoideus forming a slightly acute angle, the latter about 3.6x as long as the former, nervellus not broken. Hind coxa with granulate surface, hind tarsal claws pectinate. Tergite 1 slender, widened at middle and apex, median dorsal carina present, with distinct longitudinal striae, spiracle slightly before the middle, glymma present. Tergite 2 and its following tergites polished, with extremely few and fine punctures. Epipleurum of tergites 2 not separated from the tergite by a crease. Ovipositor sheath in length subequal to the depth of abdomen.

Key to the Taiwanese species of *Astrenis*

Temple sparsely haired. Medio-posteriorly of mesoscutum usually with 1 to 3 short, longitudinal striae, if not so, temple must be sparsely haired. Male head black in color. Hind tarsal claws dark brown. . . . . ***granum*** Chiu, sp. nov.

Temple densely haired. Medio-posteriorly of mesoscutum without longitudinal striae. Male head yellow to brown never black in color. Hind tarsal claws colorless. . . . . ***densa*** Chiu, sp. nov.

Astrenis granum Chiu, sp. nov.

♀: Fore wing (fig. 1j) 2.2–2.9 mm. long. Head (fig. 2i) in frontal view about 0.6x as long as wide. Clypeus about 2.3x as wide as long with very few scattered punctures, separated from face by a distinct groove. Malar space distinctly mat, about 0.6x as long as basal width of mandible. Face, frons and temple with very few, sparse and weak punctures, the latter rather sparsely haired. Flagellum 15 to 17-segmented. Mesoscutum (fig. 5a) sparsely finely punctate, its medio-posteriorly usually with 1–3 short striae. Mesopleurum polished, with very few punctures scattered on its upper 0.25, with a transverse depression carrying a distinct carina at its midheight. Propodeum as in fig. 5b, petiolar area weakly and extremely sparsely punctate. Hind tarsal claws with strong and dark colored pectinae. Tergite 1 (fig. 5c) 4.0–5.0x as long as apical width (the holotype about 4.4x in ratio).

Dark brown to black. Mouthparts (except mandibular teeth brown), clypeus, scape, pedicel and 3 basal segments of flagellum, light brown. Tergite 1 entirely black, tergite 2 and following tergites gradually from light brown to black, all legs (except hind leg with coxa dorsally, dorso-apical 0.5 of tibia, and tarsus, fuscous), and ovipositor fulvous. Wing hyaline, pterostigma and venation fuscous.

♂: Very similar to female in structure and color pattern, except flagellum having 17 to 19-segmented.

Holotype ♀. Tsuifeng (Nantou), 2,300 m, 6. V. 1981, K. S. Lin & S. C. Lin.

Paratypes 118♀, 44♂. Anmashan (Taichung): 2,275 m, 1♀, 6–9. VII. 1979, L. Y. Chou. Meifeng (Nantou): 2,230m, 1♀, 10. V. 1979, K. C. Chou; 2,130 m, 2♀, 2–4. VI. 1980, L. Y. Chou & C. C. Chen; 2,150 m, 23♀, 12♂, 7–9. V. 1981, K. S. Lin & S. C. Lin; 2♀, 24–26. VI. 1981, K. S. Lin & W. S. Tang; 2♀, 1♂, 22. V. 1982, L. Y. Chou; 5♀, 7♂, 19–21. IV. 1983, K. C. Chou & S. P.

Huang; 1♀, 22–23. VI. 1983, K. S. Lin & S. C. Lin; 13♀, 13♂, 8–11. V. 1984, K. C. Chou & C. C. Pan. Tayuling (Hualien): 2,560 m, 1♀, 24–26. VI. 1977, K. S. Lin; 2♀, 1♂, 9–16. VI. 1980, K. S. Lin & B. H. Chen; 1♀, 1♂, 10–16. VI. 1980, Malaise trap; 1♀, 12–15. IX. 1980, K. S. Lin & C. H. Wang; 1♀, 6–9. IX. 1983, L. Y. Chou & K. C. Chou. Tsuifeng (Nantou): 2,300 m, 2♀, 4♂, 3. VI. 1980, L. Y. Chou & C. C. Chen; 18♀, 2♂, 8. V. 1981, K. S. Lin & S. C. Lin; 6♀, 25–27. VI. 1981, K. S. Lin & W. S. Tang; 1♀, 23. V. 1982, L. Y. Chou; 1♀, 16. VII. 1982, S. C. Lin & C. N. Lin; 3♀, 1–3. IX. 1982, L. Y. Chou & K. C. Chou; 15♀, 1♂, 23–25. VI. 1983, K. S. Lin & S. C. Lin; 4♀, IV. 1984, Malaise trap; 3♀, V. 1984, Malaise trap; 1♀, VI. 1984, Malaise trap; 3♀, 5. VIII. 1984, K. S. Lin. Wushe (Nantou): 1,150 m, 6♀, 2♂, 6–11. V. 1981, K. S. Lin & S. C. Lin.

The name "*granum*" means pellet or grain, referring to its hind coxa with granulate surface.

This species can be recognized by the head entirely black. Temple with sparse and long hairs. Mesoscutum usually with 1 to 3 short striae on its medio-posteriorly.

Astrenis densa Chiu, sp. nov.

♀: Fore wing (fig. 1k) 2.2–2.4 mm. long. Head (fig. 2k) in front view about 0.6x as long as wide. Clypeus about 2.5x as wide as long, sparsely punctate, but slightly denser than those of *A. granum*, separated from face by a distinct groove. Malar space obscurely mat, about 0.6x as long as basal width of mandible. Face sparsely, weakly punctate. Temple moderately punctate with dense hairs. Flagellum 15 to 18-segmented. Mesoscutum (fig. 5d) finely moderately densely punctate, its medio-posteriorly without longitudinal carinae. Mesopleurum dorsally scattered with fine and weak punctures, with a transverse smooth depression at midheight not carrying a carina. Propodeum as in fig. 5e, petiolar area uniformly sparsely punctate. Hind tarsal claws pectinate, its pectinae somewhat soft and colorless. Tergite 1 (fig. 5f) about 5.0x as long as apical width (the holotype about 4.4x in ratio).

Brown to dark brown. Mouthparts (except mandibular teeth brown) face, clypeus and legs (except hind coxa dorsally, hind tibia and hind tarsus, blackish), yellow to fulvous. Abdomen entirely black sometimes with tergites 2 and 3 brown, ovipositor fulvous. Wings hyaline, pterostigma and venation fuscous.

♂: Very similar to female, but differs in having flagellum 17 to 20-segmented, fore wing 2.1–2.6 mm. long, head brown to dark brown, sometimes fulvous except vertex brown.

Holotype ♀. Meifeng (Nantou), 2,150 m, 24–26. VI. 1981, K. S. Lin & W. S. Tang.

Paratypes 12♀, 22♂. Alisan (Chiayi): 2,400 m, 1♂, 5–9. VIII. 1981, L. Y. Chou & S. C. Lin. Anmashan (Taichung): 2,275 m, 1♂, 6–9. VII. 1979, L. Y. Chou. Meifeng (Nantou): 2,130 m, 1♂, 10. V. 1979, K. C. Chou; 2,150m, 1♂, 20–22. VI. 1979, K. S. Lin & B. H. Chen; 2,130 m, 1♀, 2–4. VI. 1980, L. Y. Chou & C. C. Chen; 2,150 m, 1♀, 26. VIII. 1981, K. S. Lin & C. H. Wang; 1♂, 7–9. V. 1981, K. S. Lin & S. C. Lin; 1♀, 3♂, 24–26. VI. 1981, K. S. Lin & W. S. Tang; 2,250 m, 1♂, 31. VII-2. IX. 1982, L. Y. Chou & K. C. Chou; 2,150 m, 3♀, 5♂, 22–26. VI. 1983, K. S. Lin & S. C. Lin. Sengkuang (Taichung): 1,850 m, 1♀, IX. 1968, K. S. Lin; 1♂, 15–17. VIII. 1984, K. C. Chou. Tayuling (Hualien): 2,560 m, 1♀, 9–16. VI. 1980, K. S. Lin & B. H. Chen; 2♀, 5♂, 12–15. IX. 1980, K. S. Lin & C. H. Wang; 1♂, 6–9. IX. 1983, L. Y. Chou & K. C. Chou. Tsuifeng (Nantou): 2,300 m, 1♀, 1–3. IX. 1982, L. Y. Chou & K. C. Chou; 1♀, V. 1984, Malaise trap; 1♂, 23. VII. 1984, K. S. Lin.

The name "*densa*" means thick, referring to the densely haired temple.

This species can be recognized by the head brown to dark brown. Temple with dense and short hairs. Mesoscutum without striae on its medio-posteriorly.

ACKNOWLEDGEMENTS

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臺灣產福姬蜂亞科之分類
(膜翅目：姬蜂科)

邱瑞珍　翁振宇

中文摘要

福姬蜂亞科(Subfamily Phrudinae)乃姬蜂科中之一小科。體型甚小，僅知其係甲蟲類昆蟲之內寄生(internal parasitoid)。該亞科姬蜂全球記載10屬(genus)，零星分布於舊北區(Palearctic Region)，新北區(Nearctic Region)，新熱帶區(Ethiopian Region)，及東洋區(Oriental Region)。本省尚無記錄。

本文記載本省產之福姬蜂亞科5屬、11種內含2新記錄種(new record)，*Phrudus monilicornis* Bridgman 與 *Earobia paradoxus* Perkins，及9新種(new species)，分別爲 *Brachyscleroma townesi* Chiu, *B. umbilici* Chiu; *Lygurus marjoriae* Chiu; *Phrudus longius* Chiu, *P. montanus* Chiu, *P. angustus* Chiu, *P. linorum* Chiu; *Astrenis granum* Chiu及*A. densa* Chiu. 全部標本均從本省高山森林用掃網採得，而*L. marjoriae* Chiu與*E. paradoxus* Perkins係借自美國昆蟲學研究所，其餘標本均保存於臺灣省農業試驗所昆蟲標本館。

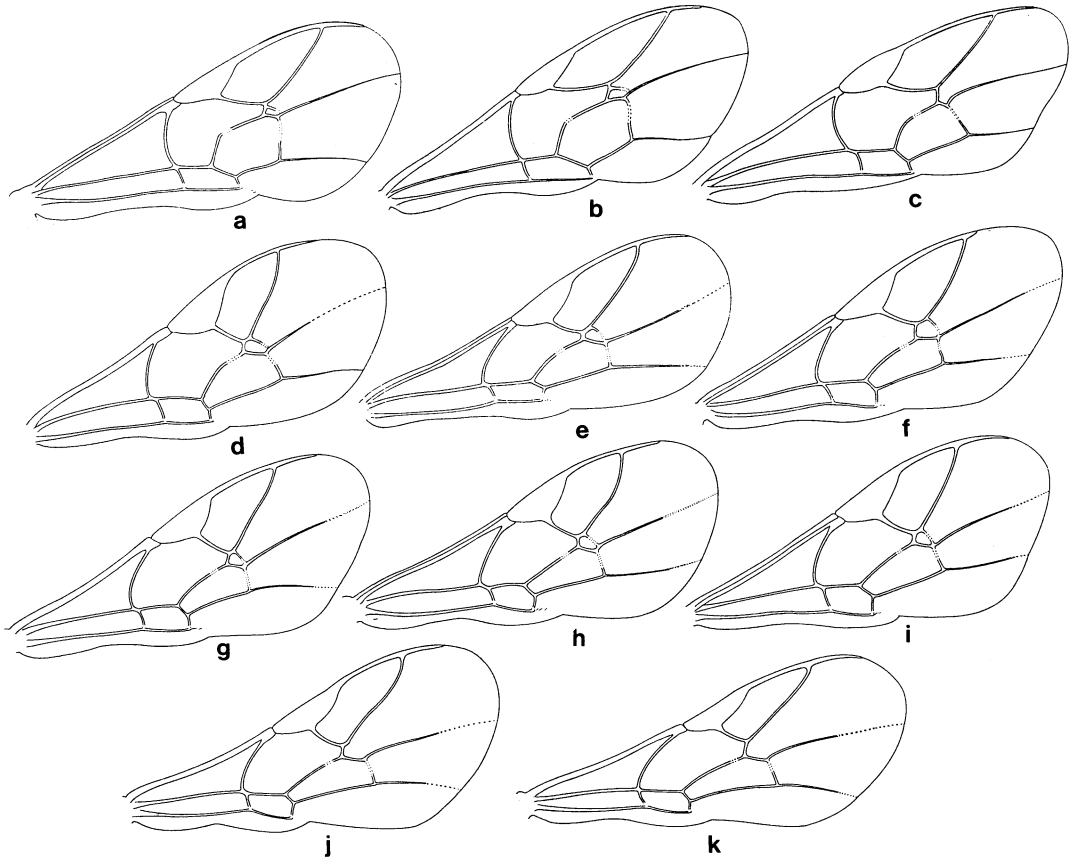

Fig. 1. Fore wings: a. *Brachyscleroma townesi* Chiu, sp. nov. b. *B. umbilici* Chiu, sp. nov. c. *Lygurus marjoriae* Chiu, sp. nov. d. *Earobia paradoxus* Perkins. e. *Phrudus longius* Chiu, sp. nov. f. *P. monilicornis* Bridgman. g. *P. montanus* Chiu, sp. nov. h. *P. angustus* Chiu, sp. nov. i. *P. linorum* Chiu, sp. nov. j. *Astrenis granum* Chiu, sp. nov. k. *A. densa* Chiu, sp. nov.

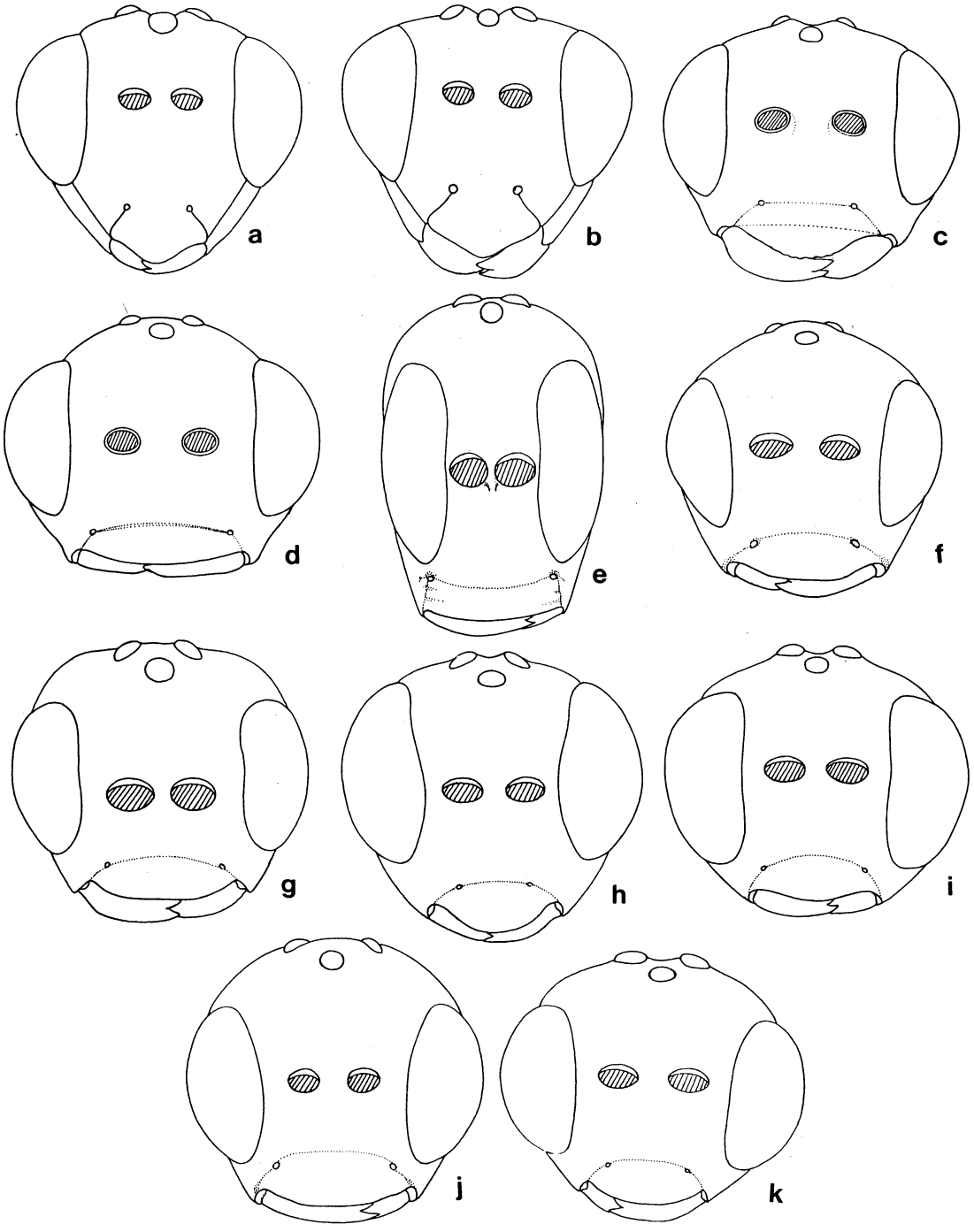

Fig. 2. Heads: a. *Brachyscleroma townesi* Chiu, sp. nov. b. *B. umbilici* Chiu, sp. nov. c. *Lygurus marjoriae* Chiu, d. *Earobia paradoxus* Perkins. e. *Phrudus longius* Chiu, sp. nov. f. *P. monilicornis* Bridgman. g. *P. montanus* Chiu, sp. nov. h. *P. angustus* Chiu, sp. nov. i. *P. linorum* Chiu, sp. nov. j. *Astrenis granum* Chiu, sp. nov. k. *A. densa* Chiu, sp. nov.

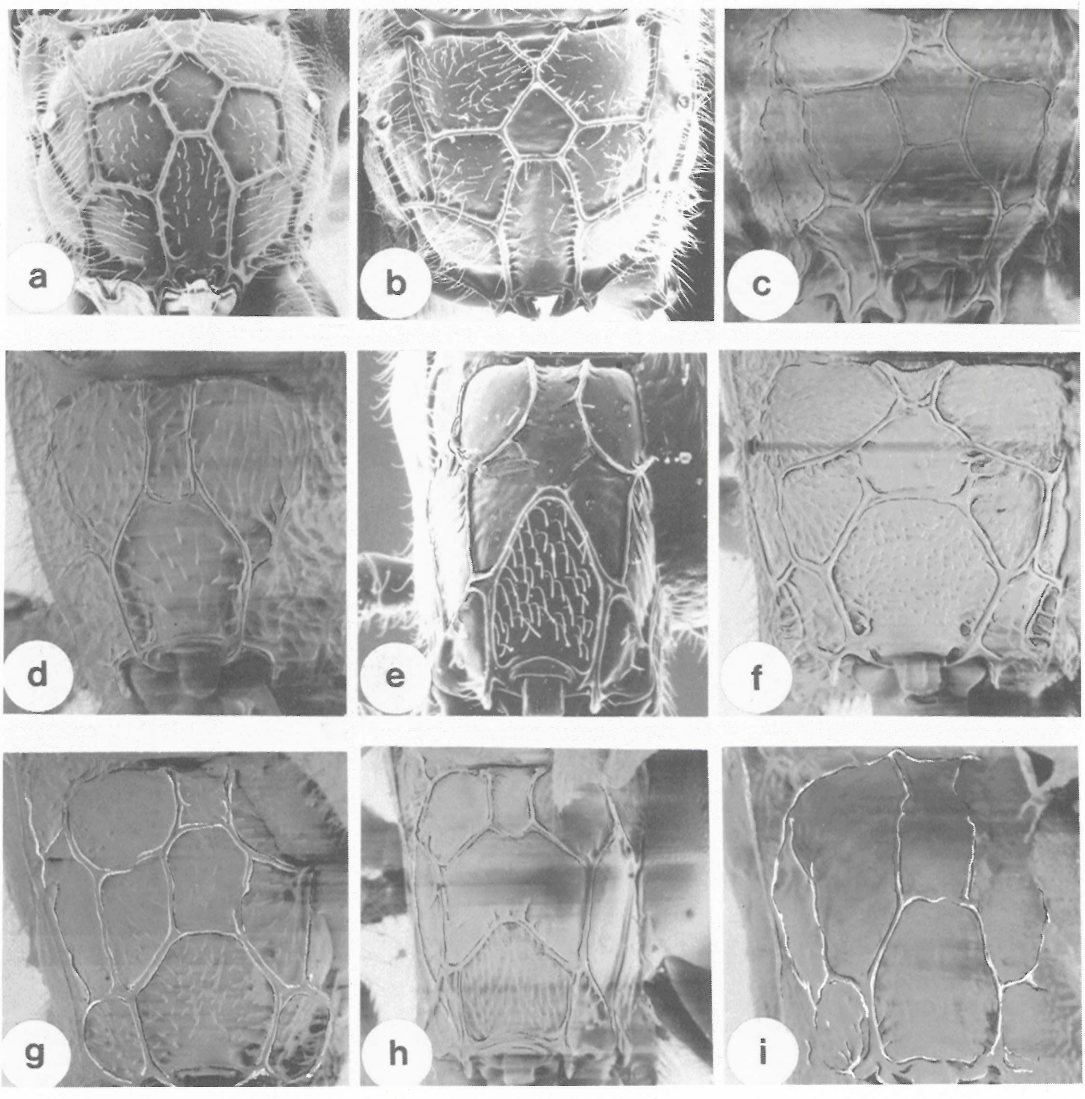

Fig. 3. Propodeums: a. *Brachyscleroma townesi* Chiu, sp. nov. b. *B. umbilici* Chiu, sp. nov. c. *Lygurus marjoriae* Chiu, sp. nov. d. *Earobia paradoxus* Perkins. e. *Phrudus longius* Chiu, sp. nov. f. *P. monilicornis* Bridgman. g. *P. montanus* Chiu, sp. nov. h. *P. angustus* Chiu, sp. nov. i. *P. linorum* Chiu, sp. nov.

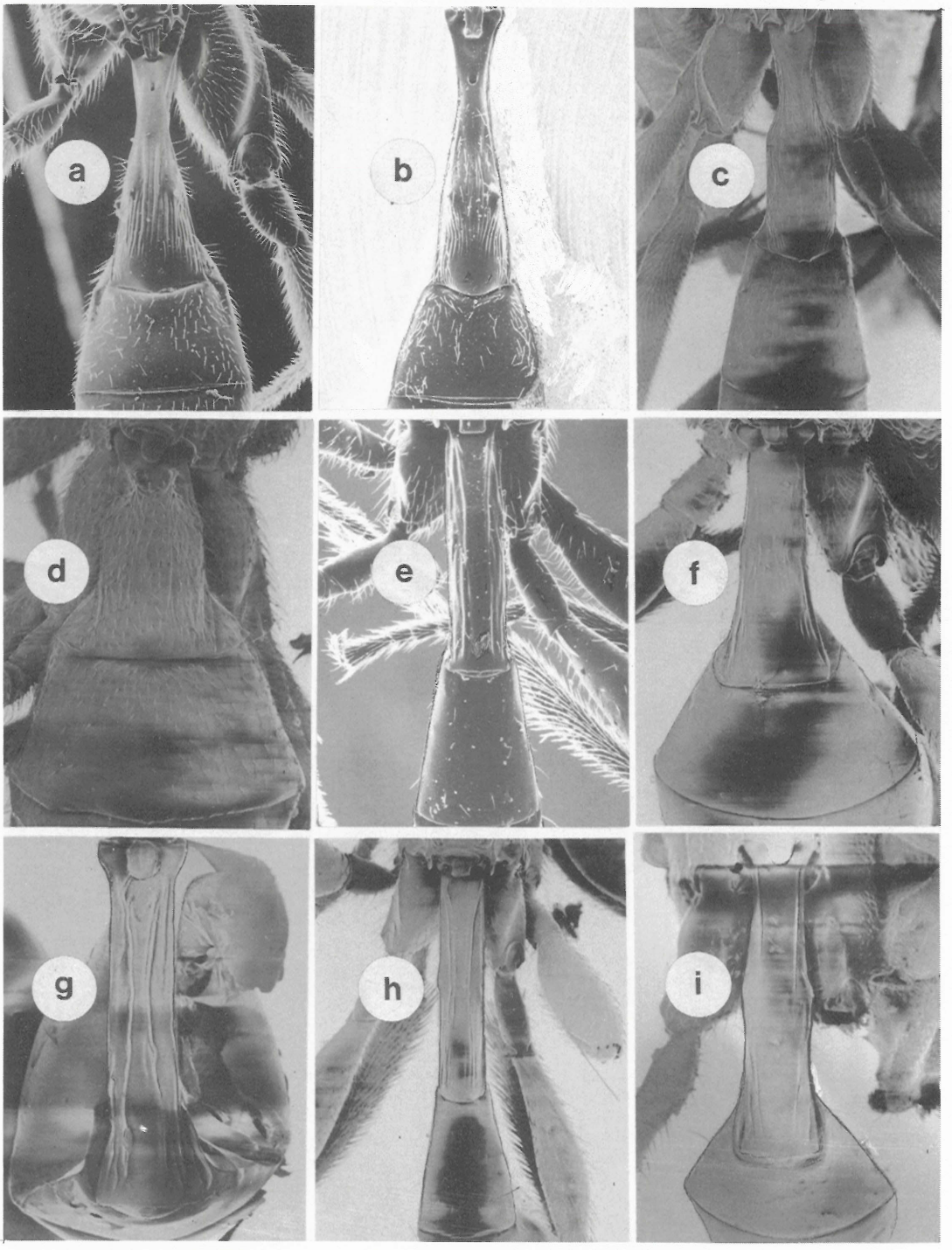

Fig. 4. Abdominal tergites 1 and 2: a. *Brachyscleroma townesi* Chiu, sp. nov. b. *B. umbilici* Chiu, sp. nov. c. *Lygurus marjoriae* Chiu, sp. nov. d. *Earobia paradoxus* Perkins. e. *Phrudus longius* Chiu, sp. nov. f. *P. monilicornis* Bridgman. g. *P. montanus* Chiu, sp. nov. h. *P. angustus* Chiu, sp. nov. i. *P. linorum* Chiu, sp. nov.

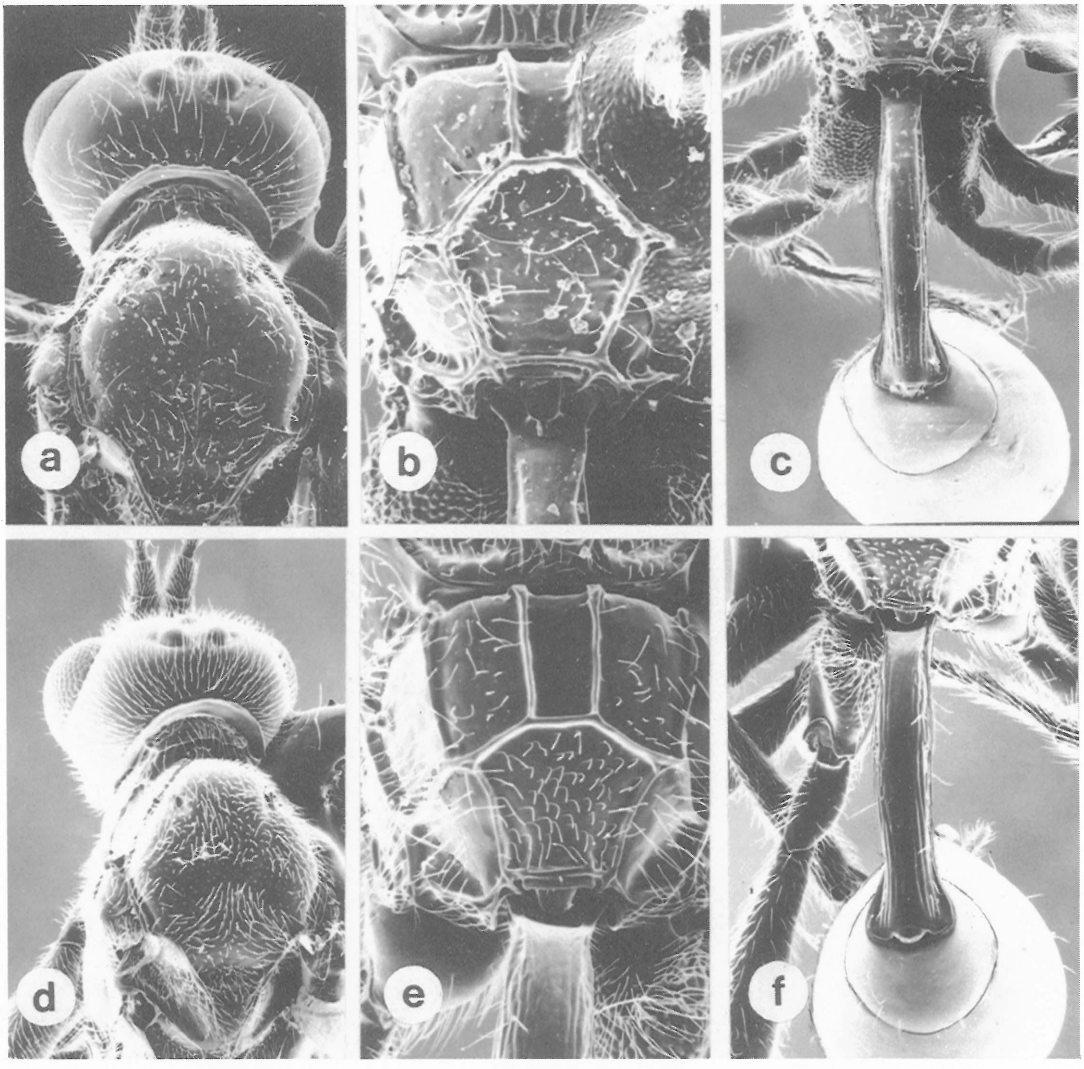

Fig. 5. *Astrenis granum* Chiu, sp. nov: a. Head and mesoscutum. b. Propodeum. c. Abdominal tergites 1 to 3. *A. densa* Chiu, sp. nov: d. Head and mesoscutum. e. Propodeum. f. Abdominal tergites 1 to 3.